



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-----------------|-------------|----------------------|---------------------|------------------|
| 09/884,284      | 06/19/2001  | Michael Chang        | 018170002500        | 3928             |

20350 7590 09/10/2004

TOWNSEND AND TOWNSEND AND CREW, LLP  
TWO EMBARCADERO CENTER  
EIGHTH FLOOR  
SAN FRANCISCO, CA 94111-3834

EXAMINER

HENN, TIMOTHY J

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

2612

DATE MAILED: 09/10/2004

3

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/884,284

Applicant(s)

CHANG ET AL.

Examiner

Timothy J Henn

Art Unit

2612

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 19 June 2001.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,6,7,9-18 and 26-31 is/are rejected.
- 7) ☒ Claim(s) 2-5,8 and 19-25 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 June 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>2</u> . | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Specification*

1. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. **It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.**

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 6, 7, 9, 10, 14-18 and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Watanabe et al. (US 6,768,513).

#### **[claim 1]**

In regard to claim 1, note that Watanabe discloses an intelligent control circuit for pixel defects in a sensor (Figure 4), the control circuit comprising: a defective pixel

Art Unit: 2612

detection circuit for detecting whether an underlying pixel is defective (Figure 4, Item 12; c. 3, l. 41 - c. 4, l. 60); and a pixel value restoration circuit for replacing the value of the underlying pixel, if defective, with a restoration value derived from the values of neighboring pixels (Figure 7; c. 7, l. 41 - c. 8, l. 3); wherein the control circuit operates in real-time (The examiner notes that the system of Watanabe operates during the readout of the image sensor (see Figures 4, 5, 6 and 7) using line delay and pixel delay elements. Therefore it can readily be seen that the system of Watanabe does not require the entire image signal to be stored and the processing to be done at a later time, thus the system of Watanabe operates in "real-time" as claimed).

**[claim 6]**

In regard to claim 6, note that Watanabe discloses neighboring pixels comprising a first group (Figure 3, Items P2, P4, P5 and P7) and a second group (Figure 3, Items P1-P8), each group being processed by the defective pixel detection circuit separately (e.g. the average, maximum and minimum level detection sections individually process the second group of neighboring pixels (see Figure 6) while the deficiency correction circuit separately processes the first group of pixels (see Figure 7)).

**[claim 7]**

In regard to claim 7, note that Watanabe discloses a first group which comprises a first plurality of pixels immediately surrounding the underlying pixel (Figure 3).

**[claim 9]**

In regard to claim 9, note that the first and second groups of Watanabe form a rectangle shape (Figure 3).

**[claim 10]**

In regard to claim 10, note that the first and second groups of Watanabe form a diamond shape if looked at from a different perspective. The examiner notes that claim 9 provides no definitions of a "diamond shape", therefore as broadly as claimed the groups of Watanabe shown in Figure 3 meet this limitation.

**[claim 14]**

In regard to claim 14, note that Watanabe discloses a sensor which is a CCD sensor (Figure 1, Item 1).

**[claim 15]**

In regard to claim 15, note that Watanabe discloses an intelligent control circuit for pixel defects in a sensor (Figure 4), the control circuit comprising: a defective pixel detection circuit for detecting whether an underlying pixel is defective (Figure 4, Item 12; c. 3, l. 41 - c. 4, l. 60), wherein the detection occurs without prior knowledge of any pixel defects (c. 8, ll. 16-28); and a pixel value restoration circuit for replacing the value of the underlying pixel, if defective, with a restoration value derived from the values of neighboring pixels (Figure 7, c. 7, l. 41 - c. 8, l. 3).

**[claim 16]**

In regard to claim 16, note that Watanabe disclose a defective pixel detection circuit which determines the type of an underlying pixel (c. 4, ll. 30-37).

**[claim 17]**

Claim 17 is a method claim corresponding to apparatus claim 1. Therefore claim 17 is analyzed and rejected as previously discussed with respect to claim 1.

**[claim 18]**

In regard to claim 18, note that Watanabe discloses the steps of assessing whether the underlying pixel is stuck high and assessing whether the underlying pixel is stuck low (c. 4, ll. 30-37).

**[claim 28]**

In regard to claim 28, note that Watanabe discloses a restoration value derived from the values of the neighboring pixels using two-dimensional extrapolation (Figure 7).

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (US 6,768,513).

**[claim 11]**

In regard to claim 11, note that Watanabe lacks a first and second group which incorporate the Bayer pattern. Official Notice is taken that the use of the Bayer pattern in image sensors is well known in the art to closely mimic the function of the human eye

Art Unit: 2612

and to take pictures with higher amounts of luminance data. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made use the Bayer pattern in the image sensor of Watanabe to more closely mimic the function of the human eye and to take pictures with higher amounts of luminance data.

6. Claims 12, 13, 26-28, 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe et al. (US 6,768,513) in view of Tabei et al. (US 5,805,216).

**[claim 12]**

In regard to claim 12, note that Watanabe lacks a line-edge detection circuit for detecting whether a line or an edge feature passes through the underlying feature.

Tabei discloses a defective pixel correction circuit (Figure 5) which includes line-edge detection (c. 2, l. 45 - c. 3, l. 8) to determine the interpolation method to be used when replacing the defective pixel (e.g. Figures 12A - 12L) to correct the defective pixel finely and exactly even in the presence of complicated boundary features (c. 8, ll. 5-8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the line-edge detection feature of Tabei to appropriately select the proper interpolation method to be used when correcting the defective pixel to finely and exactly correct the pixel even in the presence of complicated boundary features.

**[claim 13]**

In regard to claim 13, note that Watanabe lacks a spatially adaptive interpolation filter for deriving a restoration value. Tabei discloses a defective pixel correction circuit (Figure 5) which includes line-edge detection (c. 2, l. 45 - c. 3, l. 8) to determine the interpolation method (i.e. spatially adaptive interpolation) to be used when replacing the defective pixel (e.g. Figures 12A - 12L) to correct the defective pixel finely and exactly even in the presence of complicated boundary features (c. 8, ll. 5-8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to include the line-edge detection feature of Tabei to appropriately select the proper interpolation method (i.e. spatially adaptive interpolation) to be used when correcting the defective pixel to finely and exactly correct the pixel even in the presence of complicated boundary features.

**[claims 26 and 30]**

Claims 26 and 30 are method claims corresponding to apparatus claims 12 and 13. Therefore claims 26 and 30 are analyzed and rejected as previously discussed with respect to claims 12 and 13.

**[claim 27]**

In regard to claim 27, note that Tabei discloses a line-edge feature detection algorithm (c. 4, l. 21 - c. 7, l. 65).

**[claim 28]**

In regard to claim 28, note that Tabei discloses the use of one-dimensional extrapolation to form a restoration value from neighboring pixels (Figures 12A - 12D and



Art Unit: 2612

12I - 12L).

**[claim 31]**

In regard to claim 31, note that Tabei discloses a spatially adaptive interpolation along the direction of a line or edge feature (c. 4, l. 21 - c. 7, l. 65).

***Allowable Subject Matter***

7. Claims 2-5, 8, and 19-25 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

**[claims 2-5, 19 and 21-25]**

In regard to claims 2-5, 19 and 21-25, the prior art does not teach or suggest a defective pixel correction circuit comprising detection for stuck high defects, stuck low defects and abnormal sensitivity defects as claimed. Although detecting these types of defects is known in the art (see Tan et al.; "A Robust Approach for the Detection of Defective Pixels in an Image Sensor"), it is not known to detect all three types for a single image in real-time without any prior knowledge of the defective pixels of the image sensor.

**[claim 8]**

In regard to claim 8, the prior art does not teach or fairly suggest a defective pixel correction circuit as claimed in claim 6 wherein a second group of pixels which is separately processed immediately surrounds a first group of pixels.

**[claim 20]**

In regard to claim 20, the prior art does not teach or fairly suggest a defective pixel circuit which determines a type of a pixel defect wherein the determination of the type of the pixels defect occurs for at least two separate types and is performed in parallel.

### ***Conclusion***

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following prior art further shows the current state of the art in determining pixel defects without any prior knowledge of the locations of the defective pixels in an image sensor:

|      |                  |                 |
|------|------------------|-----------------|
| i.   | Itoh             | US 2001/0052938 |
| ii.  | Shimura          | US 6,307,393    |
| iii. | Nagumo           | US 4,189,751    |
| iv.  | Kobayashi et al. | JP 06-245148 A  |
| v.   | Hitomi et al.    | JP 06-205302 A  |
| vi.  | Sato             | JP 61-261974 A  |

The following further shows the current state of the art in edge-detection algorithms included in defective pixel replacement systems:

|    |              |                 |
|----|--------------|-----------------|
| i. | Hamilton, JR | US 2002/0158977 |
|----|--------------|-----------------|

Art Unit: 2612

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Timothy J Henn whose telephone number is (703) 305-8327. The examiner can normally be reached on M-F 7:30 AM - 5:00 PM, alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wendy R Garber can be reached on (703) 305-4929. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

TJH  
9/2/2004

Application/Control Number: 09/884,284

Page 11

Art Unit: 2612



TUAN HO  
PRIMARY EXAMINER